


Leica ADS100 Calibration Certificate



<i>This certificate is valid for</i>	Sensor Head	Serial Number	Control Unit	Serial Number
	SH100	10530	CC33	33601
<i>Calibration certificate issued on</i>	IMU	Serial Number	Inspector	
	CUS6	56072780		
<i>Calibration certificate issued on</i>	13 Mar 2019	<i>by</i>	Robert Bosch	

Certificate and calibration data ID **807905_10530_190313-1**
Document Code **807905**

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- when it has to be **right**

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Components

Component	Device	Type	Serial Number
SH100 # 10530	Lens system	DO65	0045
	Beam Splitter	Standard	2013-0026
	Focal Plate Module (FPM)	FPM	15092013-010
	Inertial Measurement Unit	CUS6	56072780
CC33 # 33601	Positioning system incl. GPS/GLONASS	SPAN	BMAW17380118J

Nominal FPM layout of tested system

Reference line positions

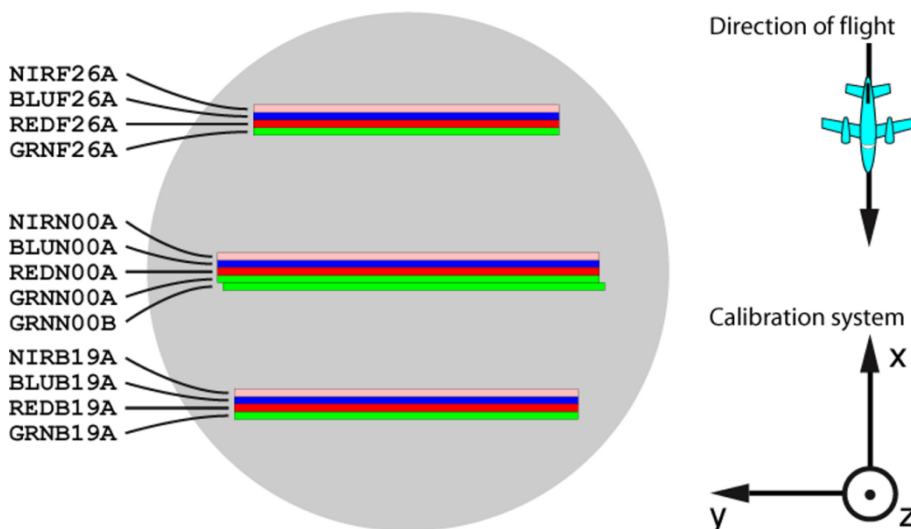
Line	X [mm]	Y [mm] Pixel 1	Y [mm] center of line	Y[mm] Pixel 20064	Usable length [pixels]
GRNF26A	30.0000	-50.1575	0.0000	50.1575	16000
GRNN00A	0.0000	-50.1575	0.0000	50.1575	20012
GRNB19A	-22.0000	-50.1575	0.0000	50.1575	18330

Positions of other lines, relative to reference line

Line	Reference	ΔX [mm]	ΔY [mm]
GRNN00B	GRNN00A	0.0025	0.0025
BLUxxxA	GRNxxxA	0.0000	0.0000
REDxxxA	GRNxxxA	0.0000	0.0025
NIRxxxA	GRNxxxA	0.0000	0.0025

View from top of Sensor Head

ADS100
FPM Layout SH100 Sensor Head



Calibration process

Adjustment and calibration of optical systems in optical laboratory




	Passed	Date	Inspector
<i>DSNU (Dark Signal Non Uniformity)</i>	ok	26.10.2017	Bernhard Riedl
<i>PRNU (Photo Response Non Uniformity)</i>	ok	26.10.2017	Bernhard Riedl
<i>Image sharpness</i>	ok	26.10.2017	Bernhard Riedl
<i>Best image plane</i>	ok	26.10.2017	Bernhard Riedl
<i>Relative geometry of staggered and multispectral lines</i>	ok	26.10.2017	Udo Tempelmann

Flight and data processing

	Passed	Date	Inspector
<i>Test flight</i>	ok	26.02.2019	Deniz Arslan
<i>GNSS and IMU data processing</i>	ok	11.03.2019	Muzaffer Adigüzel
<i>IMU accelerometer biases</i>	ok	11.03.2019	Muzaffer Adigüzel
<i>IMU latency</i>	ok	11.03.2019	Muzaffer Adigüzel
<i>Image data processing</i>	ok	11.03.2019	Muzaffer Adigüzel
<i>Geometry of reference lines</i>	ok	13.03.2019	Muzaffer Adigüzel

Inspection

Inspectors

<i>Name</i>	Bernhard Riedl	13.03.2019	
<i>Position</i>	ADS Production Manager		
<i>Name</i>	Robert Bosch	13.03.2019	
<i>Position</i>	ADS Support Engineer		
<i>Name</i>	Udo Tempelmann	13.03.2019	
<i>Position</i>	Manager System Engineering		

Maintenance

<i>Last date of service</i>	
<i>Recommendations</i>	

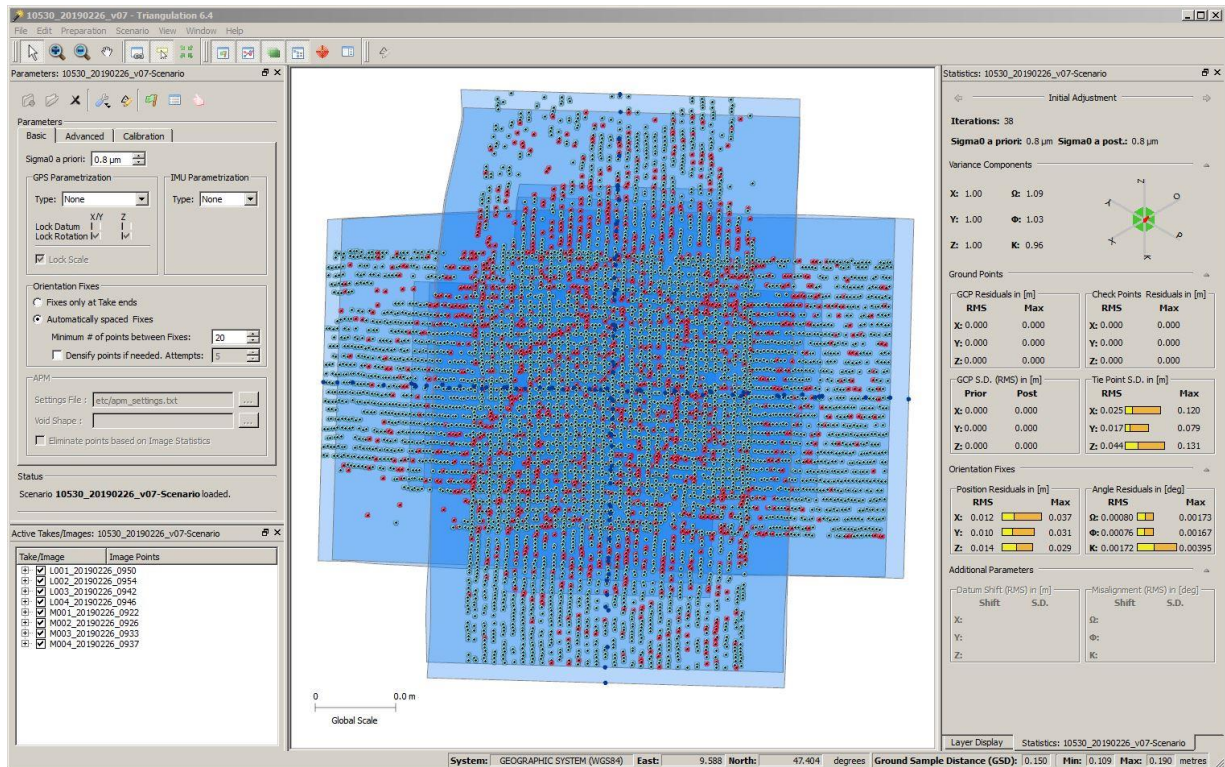
Results of geometrical calibration

Calibrated apparent pixel coordinates for all sensor lines are contained on the calibration file attached to this certificate. File: 10530_190313-1.zip

Stereo lines

A-lines	GRNN00A	GRNF26A	GRNB19A
Calibration method	Estimation of additional parameters in simultaneous bundle adjustment		
Sigma naught of bundle adjustment	0.8 micron		
Mean local redundancy	> 0.5		
Accuracy of calibrated apparent pixel coordinates	±1.0 micron		

Final bundle adjustment result:



IMU misalignment

Misalignment results in [deg]:	$\omega =$	0.02978	± 0.00011
	$\phi =$	-0.01086	± 0.00012
	$\kappa =$	0.03066	± 0.00024

Staggered green and multispectral lines

Staggered green	GRNN00B
Multispectral	BLUN00A REDN00A NIRN00A BLUF26A REDF26A NIRF26A BLUB19A REDB19A NIRB19A
Calibration method	Offsets to GRNN00A GRNF26A GRNB19A by sub-pixel correlation on image pairs of vertical and horizontal bar patterns, taken with defined rotation speed in the goniometer.
Accuracy of offsets to the green reference band:	± 0.1 micron